Towards Stream-based Reasoning and Machine Learning for IoT Applications

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Towards Stream-based Reasoning and Machine Learning for IoT Applications – *Abstract*

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Abstract—As distributed IoT applications become larger and more complex, the pure processing of raw sensor and actuation data streams becomes impractical. Instead, data streams must be fused into tangible facts and these pieces of information must be combined with a background knowledge to infer new pieces of knowledge. And since many IoT applications require almost real-time reactivity to stimulus of the environment, such information inference process has to be performed in a continuous, on-line manner. This paper proposes a new semantic model for data stream processing and real-time reasoning based on the concepts of *Semantic Stream* and *Fact Stream*, as a natural extension of Complex Event Processing (CEP) and RDF (graph-based knowledge model). The main advantages of our approach are that: (a) it considers time as a key relation between pieces of information; (b) the processing of streams can be implemented using CEP; (c) it is general enough to be applied to any Data Stream Management System (DSMS). Last, we will present challenges and prospects on using machine learning and induction algorithms to learn abstractions and reasoning rules from a continuous data stream.

Keywords—*Internet of Things (IoT); sensors; data streams; complex event processing (CEP); semantic reasoning; inference; machine learning.*